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DIVISION OF CONSUMER ADVOCACY
Department of Commerce and
Consumer Affairs
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PUBLIC UTILITIES
COMMISSION

2007 FEB - 1 P 3:45

FILED

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF HAWAII

In the Matter of the Application of)
)
HAWAIIAN ELECTRIC COMPANY, INC.)
HAWAII ELECTRIC LIGHT COMPANY, INC.)
MAUI ELECTRIC COMPANY, LIMITED)
)
Related to the Major Power Outage of)
October 15-16, 2006)

DOCKET NO. 2006-0431

DIVISION OF CONSUMER ADVOCACY'S
SUBMISSION OF INFORMATION REQUESTS TO
HAWAIIAN ELECTRIC COMPANY, INC.

Pursuant to the Stipulated Regulatory Schedule in the Stipulated Procedural Order modified and approved by the Commission in Order No. 23155, the Division of Consumer Advocacy hereby files its **SUBMISSION OF INFORMATION REQUESTS TO HAWAIIAN ELECTRIC COMPANY, INC.** in the above docketed matter.

DATED: Honolulu, Hawaii, February 1, 2007.

Respectfully submitted,

By Cheryl S. Kikuta
CHERYL S. KIKUTA
Utilities Administrator

DIVISION OF CONSUMER ADVOCACY

DOCKET NO. 2006-0431

HAWAIIAN ELECTRIC COMPANY, INC.
HAWAII ELECTRIC LIGHT COMPANY, INC.
MAUI ELECTRIC COMPANY, LIMITED

SUBMISSION OF INFORMATION REQUESTS

INSTRUCTIONS

In order to expedite and facilitate the Consumer Advocate's review and analysis in the above matter, the following is requested:

1. For each response, the Company should identify the person who is responsible for preparing the response as well as the witness who will be responsible for sponsoring the response should there be an evidentiary hearing;
2. Unless otherwise specifically requested, for applicable schedules or workpapers, the Company should provide hard copies of each schedule or workpaper together with one copy of each such schedule or workpaper on electronic media in a mutually agreeable format (e.g., Excel and Quattro Pro, to name two examples); and
3. When an information request makes reference to specific documentation used by the Company to support its response, it is not intended that the response be limited to just the specific document referenced in the request. The response should include any non-privileged memoranda, internal or external studies, assumptions, Company instructions, or any other relevant authoritative source which the Company used.
4. Should the Company claim that any information is not discoverable for any reason:

4. Should the Company claim that any information is not discoverable for any reason:
- a. State all claimed privileges and objections to disclosure;
 - b. State all facts and reasons supporting each claimed privilege and objection;
 - c. State under what conditions the Company is willing to permit disclosure to the Consumer Advocate (e.g., protective agreement, review at business offices, etc.); and
 - d. If the Company claims that a written document or electronic file is not discoverable, besides complying with subparagraphs 4(a-c), identify each document or electronic file, or portions thereof, that the Company claims are privileged or will not be disclosed, including the title or subject matter, the date, the author(s) and the addressee(s).

DOCKET NO. 2006-0431

HAWAIIAN ELECTRIC COMPANY, INC.
HAWAII ELECTRIC LIGHT COMPANY, INC.
MAUI ELECTRIC COMPANY, LIMITED

SUBMISSION OF INFORMATION REQUESTS

CA-IR-1

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 1 of 90.

The above document states that the October 15, 2006 earthquake was the "strongest earthquake recorded in Hawaii in 23 years."

Based on this statement please respond to the following:

- a. Provide the record of earthquakes recorded in the State of Hawaii from January 1, 1977 through the date of this information request for all earthquakes of magnitude 2.0 and higher. Provide the date and magnitude of each such earthquake on each island.
- b. Provide the source for the information provided in response to part (a) of this information request. For example, is the obtained from the Hawaii Volcano Observatory (Page 12)?

CA-IR-2

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 2 of 90.

Above document states that additional information was gathered through "extensive follow up information requests, and analysis of system drawings and control schematics, relevant Company logs, studies and records, personnel interviews, and other applicable

system documentation." Based on this statement please respond to the following:

- a. Provide a copy of all POWER referenced documents, recordings, phone notes, e-mails, memoranda, and work papers.
- b. Provide a copy of all HECO October 15-16, 2006 related documents, work papers, and communications (i.e., written and electronic).

CA-IR-3

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 2 of 90.

In summary, the report states: "The HECO system was in proper operating condition and appropriately staffed by personnel at the time the earthquake struck." Based on this statement please respond to the following:

- a. Provide the specific basis for this conclusion.
- b. Cite any applicable codes and standards of the electric power industry used to develop this conclusion.
- c. Cite any power industry best practices surveys and analyses used to support or derive this conclusion.
- d. Without any quick black-start capability of significant capacity (MWs) on a true "island" system by what specific logic does POWER derive this conclusion ("proper operating condition")?

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 3 of 90

- a. The above document states that "the main underlying cause of the outage was the seismic action of the earthquake triggering mercury switches on generating units Kahe 5 and Kahe 6." Based on this statement please provide the manufacturer, type, and model number for all mercury switches which are being referred to here.
- b. The above document states "the same style of mercury switches are installed in other fluid level monitoring applications in the Kahe 3, Kahe 4, Kahe 5, and Kahe 6 generating units, specifically on the feedwater level alarms" Based on this statement please respond to the following:
 1. Provide the manufacturer type and model number for all mercury switches which are being referred to here.
 2. Identify specifically which of the referenced mercury switches did not falsely alarm during the October 15, 2006 earthquake events.

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 4 of 90.

The above document states that "actions by HECO personnel were reasonable, responsible and conducted in a professional manner."

Based on this statement please respond to the following:

- a. Provide the complete roster of HECO management, EMS staff, and power plant staff on duty and/or who responded to the October 15, 2006 earthquake and island-wide blackout. Provide the name and job title/assigned position of each person as of October 15, 2006.
- b. Provide access for interview and/or deposition of each HECO management staff, EMS staff, and power plant staff who were on duty and/or responded to the October 15, 2006 earthquake and island-wide blackout. Interviews and/or depositions will be scheduled for the week of April 9, 2007. In addition, since there may not be sufficient time to conduct an interview/deposition of all personnel identified in response to part (a) of this information request, the Consumer Advocate will provide a list of the HECO personnel selected for interview/deposition on or before March 26, 2007.
- c. Provide the Building Code and Seismic Building Codes which were the basis of design and construction for each of the power generating units on Oahu. Provide the year in

which each unit entered service and cite the codes which were utilized.

CA-IR-6

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 4 of 90.

- a. The report refers to the “approved HECO operating procedures” (here and also on page 16).
 - 1. Does this refer to a document transmitted by letter dated September 24, 1992 (i.e., The “Production Department Operating Division Policy Manual” (ODPM) is dated September 1992)?
 - 2. Is September 1992 the most current version of this document?
 - 3. Is there any provision to review and update this Manual on a periodic basis?
 - 4. If so, how often does HECO conduct a review and update the Manual?
 - 5. If this is not the most current revision, provide a copy of the most current revision.
- b. The report states: “They have performed regular training;”
 - 1. Do the Dispatch Center personnel have a person devoted full time to training?
 - 2. Provide a detailed description of all training provided.

3. What personnel are required to take training?
 4. Provide copies of records indicating who received training for each type of training class conducted.
 5. Provide copies of proficiency evaluations for those who received the training identified in response to part (b)4 of this information request.
 6. Provide details of the program that assures ongoing proficiency.
- c. The report states: "The system restoration plan developed after the outage by the operations staff was reasonable. . . ."
1. Is there any type of restoration plan already developed, prior to an incident (such as the Incident Response Manual described on page 37)? Explain.
 2. If so, does this plan provide specific steps to be taken, but allow for variations required by specific situations?
 3. Provide a copy of this document plan.
 4. Why are steam units used for black start purposes rather than other faster starting units?
 5. List and explain the "critical restoration issues" that is referred to in the last paragraph on page 4.

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 4 of 90.

- a. The above document refers to "HECO Incident Command" (here and on page 38). Based on this statement please respond to the following:
 1. Provide staffing of the Incident Command.
 2. When was the Incident Command implemented?
 3. What was the Incident Command's authority during the events of October 15 and 16, 2006?
- b. The document also refers to "System Dynamics and Generation Unit Response During Normal Operation and System Disturbances" training. Based on this statement please respond to the following:
 1. Provide a copy of the document describing this training.
 2. Provide the training schedule with hours of training required for each employee in all areas.
 3. Is black start training only provided for operators at the Kahe Generating Station? Explain.
 4. If not, what other operators at the other generating stations receive black start training? Explain.
 5. What is the frequency of such black start training and exercises?

CA-IR-8

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 4 of 90.

The above document states that "in a few cases there are details in which slightly different course of action could have been taken."

Based on this statement please respond to the following:

- a. Provide a specific list of such cases and a description of each error.
- b. Were there pre-earthquake human errors such as mis-setting relays (page 27) or level transmitters which contributed to the island-wide blackout after the October 15, 2006 earthquake?
- c. List and describe each human error.

CA-IR-9

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 5 of 90.

The report states that operators with only one unit on line tripped the unit, thinking the disturbance was due to turbine vibration, while operators with two units on line investigated, and found no turbine vibration, and thus did not trip the units.

- a. Is there a procedure that documents the steps to be taken when a vibration is felt to assure that the vibration is caused by unit vibration before tripping a unit?
- b. If yes, please provide a copy of such procedure.

- c. If the operators with two units could take the time to check the cause of the vibration before tripping the units, could the same not be done for the operators with only one unit running? Explain.

CA-IR-10

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 5 and 7-8 of 90.

- a. The report concludes that HECO operated reasonably in its approach to add customer load while bringing the system back up after the blackout.
 - 1. Is there any type of plan already developed, prior to an incident specifying which loads to add, in what sequence, etc? If yes, please provide a copy of such plan.
 - 2. Does this plan provide specific steps to be taken, but allow for variations required by specific situations?

CA-IR-11

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 7 of 90.

The report discusses the restoration efforts and problems in the configuration of the black start generators and plant auxiliary systems at the Kahe Station.

- a. Why did it take over three hours and 45 minutes for these black-start units to come up?

- b. What were the black start generator configuration problems at Kahe Station?
- c. What were the problems with auxiliary systems at the Kahe Station?
- d. Please describe in detail the responses to parts (a) through (c) of this information request.

CA-IR-12

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Paragraph 3 discussed on pages 8-9 of 90.

The report does not provide a direct answer to this question: "Could the island-wide power outages on Oahu and Maui have been avoided?" See Commission Order No. 23155, Docket No. 2006-0431 at 2. Please provide a "yes" or "no" response with a detailed, specific, factual explanation to support the response. Where opinions are given or conclusions are made, please provide the specific facts upon which such statements are based.

CA-IR-13

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Paragraph 7, page 10 of 90.

The report recommends:

Assess the system restoration process following an island-wide blackout to determine the best order for generation startup that would allow load to be added in a safe and expeditious manner while carefully retaining frequency and voltage stability."

- a. Is this process contained within the "Production Department Operating Division Policy Manual" or ODPM (see page 16 of POWER)?
- b. Explain why or why not?
- c. Is this process contained in the "Incident Response Manual" or IRM (see page 37 of POWER)?
- d. Explain why or why not.

CA-IR-14

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Paragraph 7, page 10 of 90.

The report recommends consideration of the use of "the planned Campbell Industrial Park combustion turbine (which will have black start capability). . . ." Please cite the Building Codes and Seismic Design Codes that will be the basis of design and construction of the planned combustion turbine installation at the Campbell Industrial Park.

CA-IR-15

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 15-16 of 90.

- a. There are six blocks of automatic Under Frequency Load Shedding referred to, starting at 58.5 Hz, going down to 57.0 Hz. The total approximate load shed under these settings is about 413 MW "based on morning peak." Load at the time of the event was approximately 836 MW.

1. What is the morning peak load that the 413 MW of load shed is based on?
 2. What percent of that 836 MW would have been expected to be shed utilizing the automatic under frequency load shedding?
- b. The report states, at page 16, that the “Undervoltage Load Shedding Scheme consists of four blocks with 27 – 46 kV breakers that shed approximately 35% of the system load.” Based on this statement please respond to the following:
1. Explain how the Undervoltage Load Shedding Scheme interacts with the Under Frequency Load Shedding Scheme.
 2. Do both of these load shedding schemes control any common breakers?
 3. Please explain and list the breakers.
 4. For this event when frequency dipped to 51.2 Hz, should all under frequency and under voltage load shed schemes have operated? Explain.
- c. How much load of the 836 MW was expected to be shed under both automatic schemes for this event?
- d. How much load was actually shed under both schemes?
- e. Explain what caused the differences between the response to parts (a) and (b) above.

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 16-17 of 90.

The reports states that "[a] new Dispatch Center was recently constructed and began full operation at the end of March 2006."

- a. Was a new EMS system put in service with the new Dispatch Center?
- b. If so, describe the new EMS system and state the date it became operational.
- c. If it became operational in phases, please describe including all dates.
- d. Were new procedures implemented at that time with respect to the system restoration plan?
 1. If yes, please provide a copy of such new procedures.
 2. If no, please explain why not.
- e. Were new procedures integrated into the training program with respect to the system restoration plan?
 1. If yes, please describe such training program and provide a copy of the training program.
 2. If no, please explain why not.
- f. What Building Codes and Seismic Codes were used for the design and construction of the new Dispatch Center?

CA-IR-17

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 17 of 90.

The report states that the “Waiau 7-8 control room also remotely operates the Waiau 9-10 combustion turbines.” Based on this statement, please provide information regarding the remote operation of the W9 and 10 combustion turbines:

- a. Under normal conditions; and
- b. Under emergency conditions.

CA-IR-18

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 18 of 90.

The report states that black start procedures for Kahe are identified in the “Power Supply Operation and Maintenance Department, Operating Division Procedure, Black Plant Startup Operations for the Kahe generating plants Units 1 through 4. Waiau plant uses Waiau Station ‘Simulated Black Plant’ checklists for the various operating procedures.” Based on the above statement please respond to the following:

- a. Provide a complete, up-to-date copy of the referenced documents for each of these units, including legible diagrams and drawings.
- b. What training, certification, exercising, and/or testing of these procedures are performed and which HECO staff members are required to participate in such activities?

- c. Provide the names, positions, and dates of all persons conducting and receiving such training and exercises for each unit for the last five years.

CA-IR-19

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 19 of 90.

The report states that "Waiau normally runs a simulated black plant startup once a year. The last time this was performed was February 14, 2004 on W6." Based on this statement please respond to the following:

- a. Why were repairs not made to the fuel system that prevented a simulated black plant startup on August 21, 2005, 14 months prior to the October 15, 2006 earthquake?
- b. Provide the dates and descriptions of all "simulated" or actual black plant startups on each of the Waiau units for each of the past five years.
- c. Has the "intermittent fuel control valve leak" been repaired since the October 15, 2006 island-wide outage?
- d. If not, explain why not.

CA-IR-20

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 19 of 90.

The report states that "HECO performed a hands-on black start training exercise on July 20, 2006 when Kahe Unit 3 returned to

service from a maintenance outage.” Based on this statement, please respond to the following:

- a. Does HECO consider the five-hour black start training scenario an acceptable result?
- b. Given that only Kahe and Waiau units have black start capability according to this report, does HECO consider five hours an acceptable startup time for an island-wide blackout?

CA-IR-21

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 20 of 90.

The data presented on Table 1 indicates that the system load at the time of the event was 836.7 MW. For the years 2004, 2005 and 2006, please provide the following:

- a. Annual peak load;
- b. Annual energy usage;
- c. Definition of “seasons” typical on HECO system (i.e. winter, spring, summer, fall) of the years, peak usage for each season; and
- d. The 24 hourly loads for a typical weekday and weekend day in each season.

CA-IR-22

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 21 of 90.

The report mentions the staffing at the Dispatch Center at the time of the event. Please provide the following.

- a. Please provide a shift schedule that shows who is scheduled to work during typical weeks.
- b. How many people are scheduled at each of the 3 positions (SLD, LD, TD) at each time?
- c. Is there a process for “qualifying” these personnel to assure they are capable to perform the duties & requirements of the job?
- d. If so, please provide the criteria considered to determine such qualification.
- e. Are any of the North American Electric Reliability Council (NERC) processes for certifying System Operators used?
- f. Explain why or why not?
- g. If NERC is not used for certification, provide the requirements that are utilized for certification and testing.

CA-IR-23

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 22 of 90.

The report states that “[s]ome of the events did not generate an alarm. . . .”

- a. Why did this happen?

- b. Was it a failure, or was it designed that these certain events would not be alarmed?

CA-IR-24

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 26 of 90.

The report describes the 8:09:06 trip on the Koolau-Village 46 kV #1 line, which was later determined to be due to an insulator failure. What seismic design basis is needed for design and construction of HECO electric transmission lines?

CA-IR-25

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 26 of 90.

The sequence of events discusses the start up of Waiau CTs and mentions that “CTs take approximately 15 minutes from initiation of start to synchronization to the grid.” Based on this statement, please respond to the following.

- a. Provide the manufacturer’s starting curve and specific starting sequence and timing.
- b. Describe any emergency start provisions that would result in synchronizing times quicker than 15 minutes.

CA-IR-26

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 27 of 90.

The report states that “[n]ine of the relays did not show a target of the event log had been overwritten” so it could not be determined

with certainty whether the relays operated. Based on this statement, please respond to the following.

- a. Was this a failure of a system, or due to design? Please explain.
- b. With a very new EMS system, it is expected that provisions would be in place to capture all pertinent data for later analysis. Is this the case? Please describe.

CA-IR-27

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 27 of 90.

The report states that at “7:13:19 – The LD initiated remote startup of distributed generators (DGs), but the DGs were unable to complete the startup sequence and connect to the grid.” What were the problems encountered during the startup sequence and connecting to the grid?

CA-IR-28

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 30 of 90.

The report states that the “frequency dropped to about 51.2 Hz and then recovered over about 20 seconds to about 55.5 Hz”

- a. Was all automatic under Frequency Load Shedding initiated by this time?
- b. How many MW were shed by automatic action?

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 31 of 90.

The report states that the frequency had been as low as 51.2 Hz, but “the system frequency recovered to about 56.7 Hz. At this time, after operating at a low frequency for several minutes, the K1-2 CO and Station Superintendent made the decision to separate the K1-2 units from the system to try to island to the local load with its auxiliaries due to the severe underfrequency situation”

- a. Was the decision to separate conveyed to the SLD or LD?
Please explain.
- b. The report states that the SLD and LD were “inundated by the number of alarms logging on the EMS (over 3600 in the course of 20 minutes)” Based on this statement, please respond to the following.
 1. Describe how the alarms are prioritized.
 2. Describe how the prioritization is presented to the SLD and LD.
 3. Are the alarms grouped to indicate a single event causing multiple alarms? Please explain and describe.
- c. Provide copies of EMS screens that are examples of the response to parts (b)1-3 above.

CA-IR-30

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 33 of 90.

The report states that “[o]thers were not aware this had been an earthquake until it was announced on the Hotline.” Based on this statement please respond to the following:

- a. Are there any devices at sites away from the power plants to detect seismic activity?
- b. If so, is this information made available to the Control Center on an immediate basis?
- c. If not, can this be done?

CA-IR-31

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 33 of 90.

The report states that the Kahe 1 "Master Fuel Trip" tripped on low fuel pressure and shut off fuel to the burners.

- a. Provide the fuel operating range and turn-down ratio for each of the generating units.
- b. Provide a copy of the fuel supply operating procedures and distribution schematics.

CA-IR-32

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 36 of 90.

The report states that the “automatic Under Frequency Load Shed (UFLS) and Under Voltage Load Shed (UVLS) schemes activated

and assisted in shedding load as designed.” Based on this statement, please respond to the following.

- a. Did these two schemes shed all the load that was expected?
- b. Please explain and describe the response to part (a) of this information request.
- c. Describe the process to manually shed load?
- d. How much time does it take to shed one circuit?
- e. Can groups of circuits be shed with one step or sequence of steps? Please describe.
- f. Provide copies of EMS screens that give load shedding capabilities to the SLD and LD, and describe the steps that must be taken.
- g. Explain the circumstances concerning the “two breakers that apparently did not operate”

CA-IR-33

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 37 of 90.

The report states that the “vast majority of customers were restored, at about 0155 hours on October 16, 2006.”

- a. How many customers and how much load were still out at this time?
- b. Were there any major or critical customers still out, like hospitals, airports, etc.?

- c. If the response to part (b) of this information request is yes, please identify the affected customers.

CA-IR-34

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 37 of 90

The report states refers to HECO's "confidential Incident Response Manual (IRM)." Please provide a complete copy of this document.

CA-IR-35

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 38 of 90.

The report refers to the "Incident Command Team."

- a. Who are the individuals on the "Incident Command Team?"
Identify each individual and indicate the person in charge ("Incident Commander", page 49).
- b. Is this team in place before an event occurs?
- c. What is the process for keeping the members of this team current, and trained in their duties?

CA-IR-36

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 38 of 90.

The report states a number of times that HECO's Incident Command was developing a restoration plan.

- a. What was the restoration plan before October 15, 2006?
- b. What was the black start plan before October 15, 2006?

- c. Were these plans ready to be implemented at all locations?
Explain.

CA-IR-37 **Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 40 of 90.**

Please provide a copy of the 1991 Blackout Report.

CA-IR-38 **Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 40 of 90**

The report states that "unstable unit operations could result in exceeding environmental operating limits, thus requiring a forced shutdown of the unit." Based on this statement, please respond to the following.

- a. Is it HECO's position that during an island-wide blackout, the environmental agencies that have jurisdiction over air emissions would not have excused a short-term emissions excursion in order to restore power to the island more quickly? Explain.
- b. Provide a copy of the Operating Air Permit in effect for the unit(s) in question on October 15, 2006.

CA-IR-39 **Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 42 of 90.**

The report states that "[w]ith the assistance of the dispatchers and the Test Engineer, the PTMs were directed on how to troubleshoot

the problem with the breakers.” Based on this statement, please respond to the following.

- a. Is training provided to PTMs on troubleshooting breakers?
Explain.
- b. Was this something that was not covered in the training?

CA-IR-40

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 45 of 90.

The report states that "HECO's fuel supply is transported from holding tanks to the power plants primarily via pipelines.” Based on this statement please respond to the following:

- a. Provide diagrams of HECO's entire fuel unloading storage and transport systems. Include maps indicating locations of pipelines pumping stations and storage tanks.
- b. Provide a description of fuel storage and forwarding facilities at each of HECO's black start units.
- c. Are back-up diesel generating units provided for fuel pipeline pumping stations?
- d. If not, why not?

CA-IR-41

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 47 of 90.

The report states that there was communication with outside agencies “whose input was considered in the restoration prioritization.”

- a. Has there been discussion and input from these agencies prior to any events to get that input ahead of time?
- b. If yes, please describe.
- c. Mention was made of the desire to restore power to critical customers first, but that such desire was “tempered by the prudence and efficiency of restoring loads along the way”
 1. What are the specific instructions on restoring power to these critical customers?
 2. Who are the critical customers? Please provide a list.
 3. Who has the authority to restore other load “along the way” before moving directly to critical customers?

CA-IR-42

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 49 of 90.

The report states that the “decision to simultaneously attempt black start at both Kahe and Waiau was made early by the Manager of System Operation and Manager of Power Supply Operations and Maintenance in consultation with the Incident Commander and the

Vice President of Power Supply” Based on this statement, please respond to the following.

- a. Explain the decision to simultaneously start both of these Plants.
- b. Provide the predetermined plan for black start.

CA-IR-43

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 49 of 90.

The report states that the “UO reported that his previous experience had been to start the black start units and synchronize them with the grid.” What black start training had that UO received?

CA-IR-44

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 52 of 90.

The report describes the Waiau Station restart problems. Based on this discussion, please respond to the following.

- a. What is the expected life of the batteries on W 9 and 10?
- b. Were these batteries part of the original installation?
- c. If so, were they replaced and when?
- d. If not, when were they installed?
- e. Provide a copy of the battery preventive maintenance procedures.

- f. Provide a copy of the instrument air and nitrogen supply piping schematics.
- g. Are alarm points provided for the following:
 - 1. Low batteries on the DCS?
 - 2. Local alarm?
 - 3. Control room alarm?
 - 4. Low instrument air and/or nitrogen pressure?
 - 5. Local alarm?
 - 6. Control room alarm?

CA-IR-45

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 57-58 of 90.

The report discusses the Waiau units 9 and 10 lack of black start capability. Based on this discussion, please respond to the following.

- a. Has HECO considered using a DG unit or diesel to give black start capability to these units? Please explain.
- b. What is the projected cost to give black start capability to these units?
- c. Page 58 states that "W9 and W10 must operate with a minimum of 5 MW of load for each machine to prevent violating the air quality permit." Based on this statement, please respond to the following.
 - 1. Provide a copy of the air quality permits for W9-10.

2. Are there provisions for operations in violation of normal levels of permitting for emergency conditions?

CA-IR-46

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 58 of 90.

The report discusses “[t]he distributed generation (DG) diesel units at three HECO substations” as being “available on October 15 and are designed to provide peaking power.” Based on this statement, please respond to the following.

- a. What is the reason for siting the DG units where they are located?
- b. Describe what would be required to move the “distributed generation (DG) units at three HECO substations” to power plant sites to provide black start capability?

CA-IR-47

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 59 of 90.

The report states "the black-out of the system was not connected with any shortcomings in the HECO processes for the long-term planning of generating capacity" Based on this statement, please respond to the following.

- a. Given that HECO’s black start training exercises required five hours to complete black startup of the Kahe and Waiau steam units, would it not have been prudent of HECO to

have installed one or more aeroderivative combustion turbine generator sets with black start capability that could attain full load in less than 10 minutes?

- b. If no, explain in detail why not.
- c. Why are there no combustion turbine generator sets of significant capacity in the HECO fleet that have diesel engine starting means and are interconnected to start and pull up a dead bus? Please explain since such units are commonly available.
- d. HELCO and MECO utilize quick starting aeroderivative combustion turbine generating sets (GE LM2500 models). Why does/did HECO not use these or other similar generating sets on Oahu? Explain in detail.

CA-IR-48

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 62 of 90.

The report describes HECO's Turbine Vibration Detection Systems. Based on this discussion, please respond to the following.

- a. Provide the type and model of vibration detection systems that are installed on each generating unit.
- b. What type of vibration displays are provided in the control room for each generating unit?
- c. Does the Turbine Supervisory system have vibration tripping capabilities?

- d. What is the normal mode of operation for the generating units? (manual or automatic)
- e. How often are the Boiler/Turbine/Generator control and protection systems re-calibrated and tuned for accuracy, response time, and repeatability?
- f. Does the Boiler/Turbine/Generator control system have automatic runback capabilities on all of the generating units?
- g. If so, what is the runback sequence for each of the generating units?

CA-IR-49

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 64 of 90 Paragraph 3.

Section 3.2.2. of the report discusses the EH low fluid lockout trip of the Kahe 5 and 6 units. Based on this discussion, please respond to the following.

- a. Did the operator receive a “Low Fluid Level Alarm?”
- b. Was the 86 LFT “Low Fluid Level Lockout” relay part of the original installation?
- c. If not, when was this relay added to the system and why?
- d. What is the E.H. system pressure decay rate on K5 and K6 at the low-pressure reservoir? (pump off to pump on)?

CA-IR-50

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 65 of 90.

Once the 86 LFT relay is locked out and the operator takes the appropriate corrective action please respond to the following.

- a. Under normal operating conditions how much time will elapse?
- b. What is the appropriate action for the operator to take to correct a “Low Fluid Level Lockout?”
- c. Have there been problems in the past with K5 and K6 E.H.?
 1. If so, what were the problems?
 2. When did the problems occur?
 3. What was done to correct these problems?
- d. What were the low EH fluid level alarms settings on each of the generating units?
- e. What were the low low EH fluid level trip settings on each of the generating units?

CA-IR-51

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 67 of 90.

- a. What are the alarm priorities on K5 and K6?
- b. How are the alarm priorities differentiated?
- c. What is the experience level of the operational staff on duty on October 15, 2006?

CA-IR-52

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 68 of 90.

The report states that “[a]fter the initial tremor, it was clear to the Dispatch Center personnel that the system had experienced an earthquake.” How soon did the Dispatch Center announce the earthquake to the Power Plants on the hotline?

CA-IR-53

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 69 of 90

The report references the “HECO Operations Manual – Section IV, Severe System Frequency Depression.”

- a. Is this part of the “approved operating procedures” referenced on page 4 of the report?
- b. If not, please provide a copy of the referenced document.

CA-IR-54

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 70 of 90.

The report that “[o]ver the Hotline, power plant operators were asked by the LD to try to hold on to the system.” Describe the sequence and timing of this request and the interaction with the separation of K1-2.

CA-IR-55

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Page 70 of 90.

The report provides the Low frequency operation background. Based on this discussion, please respond to the following.

- a. What are the low frequency capabilities of the HECO steam turbine generation units?
- b. Provide OEM low frequency limits for each of the generating units.

CA-IR-56

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 71 of 90.

The report references the HECO steam generating unit critical limitations. Based on this discussion, please respond to the following.

- a. What are the critical RPM, frequency, and loads for the HECO steam generating units?
- b. What is the testing and calibration procedure for the under frequency relays for each generating unit?

CA-IR-57

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 71 of 90.

The report states "[t]he indications are that the automatic load shed schemes operated mostly as planned." Based on this assertion, please respond to the following.

- a. Did this apply to both frequency and voltage schemes?

- b. How did these schemes NOT operate as planned?
- c. What was the cause of this not operating as planned?
- d. Please describe.

CA-IR-58

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 72 of 90.

- a. Provide under frequency trip settings for each of the HECO generating units and the IPP's.
- b. Why are the under frequency trip settings for the IPP higher than the trip settings of the load shedding blocks 1 through 5?

CA-IR-59

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 72 of 90.

The report mentions that “[t]wo breakers were noted to not have tripped during the automatic load shed sequence.” Based on this representation, please respond to the following.

- a. What is the total number of breakers in the “automatic load shed” schemes?
- b. How many breakers operated properly?
- c. How many breakers did not operate properly?
 - 1. Explain why the breakers were believed to have not operated properly.
 - 2. Please describe.

2. Please describe.

d. Are these the same breakers referred to on page 27?

CA-IR-60

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 73 of 90.

The report describes situations that “can allow the two IPPs to trip before the majority of the automatic load shed occurs.” Based on this statement, please respond to the following.

- a. Is there a reason to operate and have these trip points set like this?
- b. Have there been discussions with the IPPs about coordination during emergency operations?
- c. Are the IPPs willing to make changes to help during these times?
- d. Has consideration been given to close back in to a dead bus?
- e. Please explain.

CA-IR-61

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 74 of 90.

The report describes the black start process at Kahe and Waiau Generating Stations on October 15, 2006. Based on this discussion, please respond to the following.

- a. What is the procedure for reducing the drum pressure when striving for a hot start as experienced October 15, 2006?
- b. What is the experience level of the operating and maintenance staff on duty during the system troubleshooting function?
- c. What is the training requirement for those employees performing system-troubleshooting function?
- d. What is the normal mode of operation for the generating units and associated systems (i.e., automatic or manual)?
- e. Provide the nameplate information on the black start Solar Combustion Turbines at the Kahe and Waiau generating stations.

CA-IR-62

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 75 of 90.

The report states that the “CIP CT planned for 2009 will have black start capability and should be able to be on the bus within an hour.”

Based on this representation, please respond to the following.

- a. What is the location and electrical connectivity to the High Voltage system?
- b. Identify the make, model number, and nameplate data for this unit.
- c. Provide the start up sequence and times given by the manufacturer that causes the one hour start time.

- d. Are there provisions that can be made to decrease this black start time?
- e. If the response to part (d) of this information request is yes, please describe such provisions.
- f. Is there an emergency start capability for this model that would result in a time less than one hour?
- g. Will it be able to start an island against a dead bus?
- h. In air permitting for this unit, is consideration being given to secure exceptions during emergency conditions?
- i. If not, why not.
- j. Provide a copy of the construction air permit for this unit.

CA-IR-63

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 78 of 90.

The report states that “[s]tarting diesel engines, on Maui and the island of Hawaii, could be characterized as needing only minutes for each engine.” Based on this representation, please respond to the following.

- a. Is it possible to install these type engines on Oahu?
- b. Please explain.
- c. Could small diesel units be installed to provide black start capability to existing combustion turbine units?
- d. Please explain and provides cost estimates.

CA-IR-64

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 82 of 90.

The report states that "[t]he Kalaeloa Combustion Turbine 2 tripped on underfrequency but remained on line, supply local auxiliary or 'house' load for some time, until it had to be shut down for operational reasons." Base on this representation, please respond to the following.

- a. What were the operational reasons?
- b. What type of training is required to become a Control Operator (i.e., on-the-job, classroom and/or simulator)?

CA-IR-65

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage –Page 83 of 90.

Regarding HECO's operating staff at all of the generating stations, please respond to the following.

- a. What type of training is provided by HECO (i.e., on-the-job, classroom and/or simulator)?
- b. What is the control operator's qualification process?
- c. Are the operators required to re-qualify after a given period of time?
- d. Is the black start sequence part of the control operators' qualification and requalification?
- e. What generating unit control system upgrades have been made to-date?

- f. Have these upgrades improved reliability and response time during emergency conditions?
- g. What systems or generating units do the present simulators emulate?

CA-IR-66

Ref: Document Operating Manual, Section III, Part E, Page 2 of 7, Paragraph D.

The manual states that Combustion Turbines, W9 and W10, can load up at 18 MW/Min up to 44 MW.

- a. Is this from a cold start?
- b. If not, what is the total time from cold start to 44 MW?
 - 1. Under normal conditions?
 - 2. Under emergency conditions?

CA-IR-67

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Review of External Communications on the Island of Oahu – Page 17 of 19.

The above document states that HECO is presently "redesigning its land line connectivity to provide backup carrier circuits"

- a. Based on this statement, please describe in detail the changes and additions that are being done.
- b. Are additional lines being added?
- c. If so, how many?

- d. Are additional switches being added to permit change over to backup lines?
- e. Will this be fully redundant?

CA-IR-68

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Review of External Communications on the Island of Oahu - Page 3 of 19.

The Company's report states that the October 15, 2006 earthquake "was a rare and significant event."

- a. How many island wide outages have there been in the last 30 years. Please list dates, durations and causes.
- b. Given this history, what is HECO's expectation of the frequency of this type event?
- c. Explain in detail HECO's plans to assure communication capability during this type event?

CA-IR-69

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Review of External Communications on the Island of Oahu - Page 7 of 19.

- a. Concerning the unavailability of landline phone service, wireless phone service, and Internet service; do any of the providers have back up emergency generation capability? Please describe in as much detail as available.
- b. If not, has this been considered? Please describe.

- c. Has consideration been give to locate any of the HECO DG units at the sites of these critical customers' facilities?
- d. Explain why or why not.
- e. Have geo satellite phones been considered? Please explain.

CA-IR-70

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Review of External Communications on the Island of Oahu - Page 8 of 19.

The Company's report mentions "live TV appearances" as actions taken by the Company.

- a. Which TV stations were available during the entire island wide outage?
- b. Do the TV stations have emergency generation capabilities? Please describe.
- c. How effective are TV broadcasts expected to be during an island wide blackout when most citizens do not have power to operate TVs?
- d. The Company's report states that the DCC "began making phone calls to HECO's System Operations personnel" within three minutes of the earthquake.
 - 1. How did the DCC find out about the occurrence?
 - 2. Please describe.

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Review of External Communications on the Island of Oahu – Page 9 of 19.

The Company's report mentions the inability to contact KSSK, the primary emergency broadcast radio station, by phone and the need to send a staff member to KSSK studio in order for such contact to be established.

- a. The report continues by stating that "[a]rrangements were made with the KSSK news director to provide regular phone updates to KSSK." How was this expected to be accomplished given the earlier inability to make phone contact? Please describe in detail how this would be accomplished.
- b. There is discussion of HECO's attempt to access the Company's computer network which contained "emergency communications reference materials including unpublished radio station phone numbers." Getting the numbers was delayed until access to the HECO computer network was gained. Were there other methods to obtain these numbers, such as written lists, etc? Please explain.

CA-IR-72

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Review of External Communications on the Island of Oahu – Page 14 of 19.

- a. The report references the need to contact and restore power to the larger commercial customer accounts. Do any commercial customers have emergency generation facilities?
- b. If yes, please list and describe the facilities that each customer has.
- c. Does HECO have a complete list of customer owned generation? If yes, please provide a copy of the list.

CA-IR-73

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Review of External Communications on the Island of Oahu – Page A2.

- a. The report mentions "HECO's new Dispatch Center in 2006." What are the backup power supply facilities for this facility?
- b. Please provide a detailed explanation and copies of diagrams.
- c. What is the preventative maintenance and schedule of the preventive maintenance for these backup supplies?
- d. Provide any test procedures and schedules for the backup power supply testing.

- e. Provide a detailed explanation of which parts of the Ward Avenue facility are served by the backup supply, including the new Dispatch Center.
- f. Describe the functions that were included in the backed up areas.
- g. What Building Code and Seismic Design Code were used as the basis of design and construction of the new Dispatch Center?

CA-IR-74

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Review of External Communications on the Island of Oahu – Page 18 of 19.

One action item includes the need to expand the list of unpublished radio station phone numbers and including the list in multiple reference locations for ready access.

- a. Provide a copy of this process, including timeframes for updating, locations for storage, etc.
- b. Is this list included in HECO's emergency preparedness plan, or any document similar to that?

CA-IR-75

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Review of External Communications on the Island of Oahu – Page A1.

- a. At 7:20 a.m., the log indicates that “[c]alls to the media cell phone following the second quake” were made. Was there

any additional outage related impact from the second quake or after shocks?

- b. If yes, please describe.
- c. Please provide all details, time lines, etc. on this second quake.

CA-IR-76

Ref: Document Investigation of 2006 Oahu Island-Wide Power Outage – Review of External Communications on the Island of Oahu – Page A2.

- a. At 10:00 – 10:30 a.m., the drafting of the first press release was started. Is there a previously planned process and drafted press release for an island wide outage?
- b. If yes, please provide a copy of the draft and describe the process to be followed.

CA-IR-77

Ref: Document October 19, 2006 Combined HECO, HELCO, and MECO Briefing to the Commission and the Division of Consumer Advocacy November 1, 2006 Transmittal.

- a. Attachment 2, HECO's PowerPoint presentation. The black and white print copy is not readable. Please provide a color, electronic PowerPoint file or pdf file of presentation.
- b. Attachment 5, HELCO PowerPoint presentation. The black and white print copy is not readable. Please provide a color, electronic PowerPoint file or pdf file of presentation.

- c. Attachment 6, MECO PowerPoint presentation. The black and white print copy is not readable. Please provide a color, electronic PowerPoint file or pdf file of presentation.

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing **DIVISION OF CONSUMER ADVOCACY'S SUBMISSION OF INFORMATION REQUESTS TO HAWAIIAN ELECTRIC COMPANY, INC.** was duly served upon the following parties, by personal service, hand delivery, and/or U.S. mail, postage prepaid, and properly addressed pursuant to HAR § 6-61-21(d).

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DATED: Honolulu, Hawaii, February 1, 2007.

Ann Iwotawa